AUSTPAC RESOURCES N.L.

THE ERMS SR PROCESS

Ilmenite to Synthetic Rutile by Hydrochloric Acid Leaching

The ERMS SR Process

- **ERMS - A roasting process that selectively magnetizes ilmenite and markedly enhances its leachability in hydrochloric acid**

- **EARS - Proprietary process to regenerate *superazeotropic* hydrochloric acid from iron chloride liquors**

ERMS SR Flow Sheet

Mineral separation plant

Ilmenite concentrate

Magnetic separation

ERMS roaster

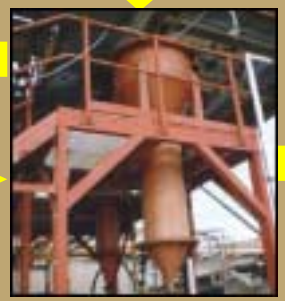
Roasted ilmenite

SPENT LEACH LIQUOR

REGENERATED ACID

Inert oxide pellets

EARS acid regeneration



ERMS leach vessels

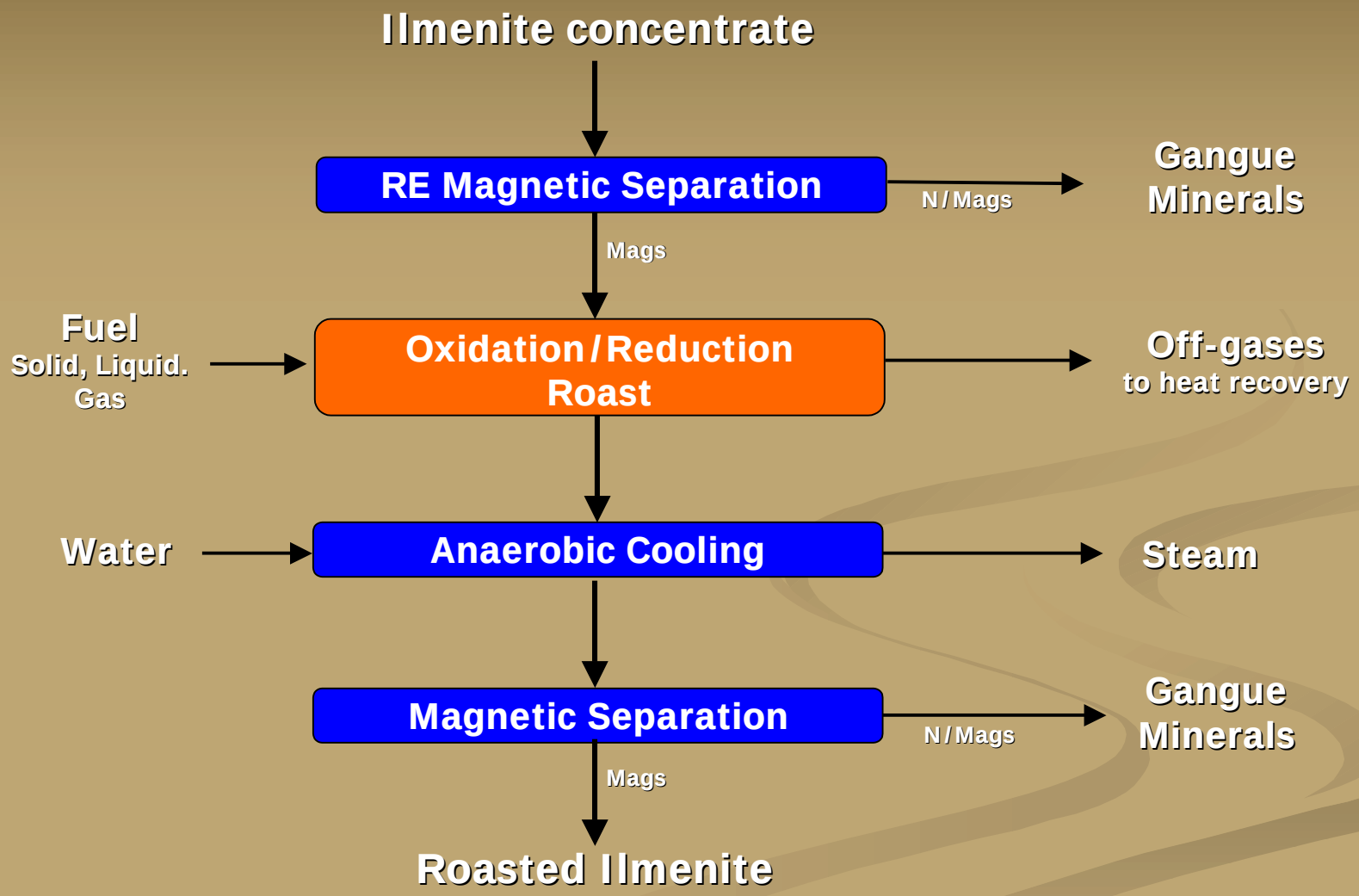
SYNTHETIC RUTILE

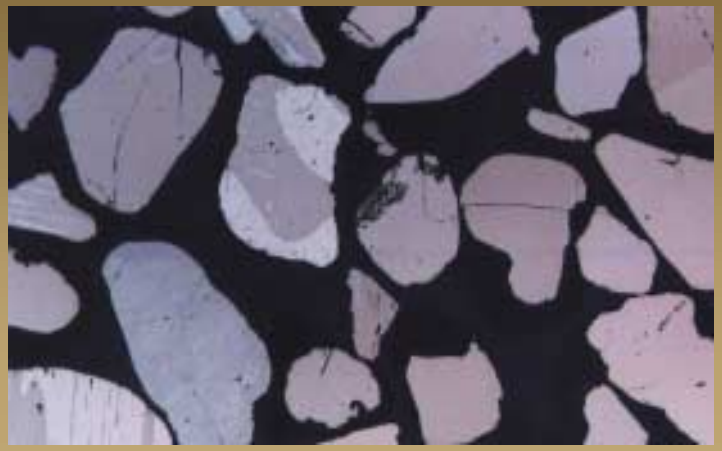
Austpac Pilot Plant

Ilmenite Roasting

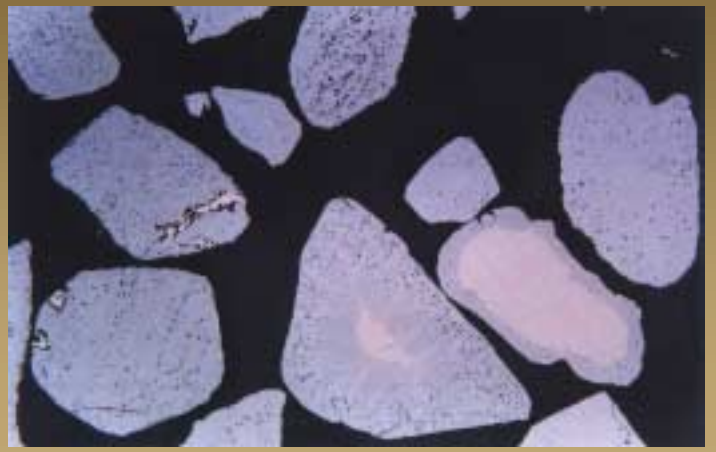
- Enhances magnetic susceptibility, enabling ready separation of gangue minerals
- Conditions ilmenite for rapid and selective leaching in hydrochloric acid
- Renders the TiO_2 content insoluble
- Increases the solubility of the iron and other unwanted constituents

Roasting

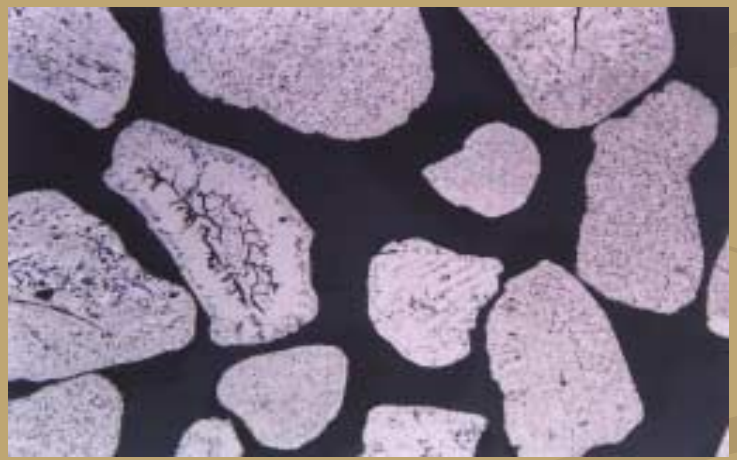

Ilmenite concentrate
RE Magnetic Separation
N/Mags
Gangue Minerals
Mags
Fuel
Solid, Liquid. Gas
Oxidation/Reduction Roast
Off-gases
to heat recovery
Water
Anaerobic Cooling
Steam
Magnetic Separation
N/Mags
Gangue Minerals
Mags
Roasted Ilmenite



Unroasted Ilmenite



Oxidised Ilmenite



Reduced Ilmenite

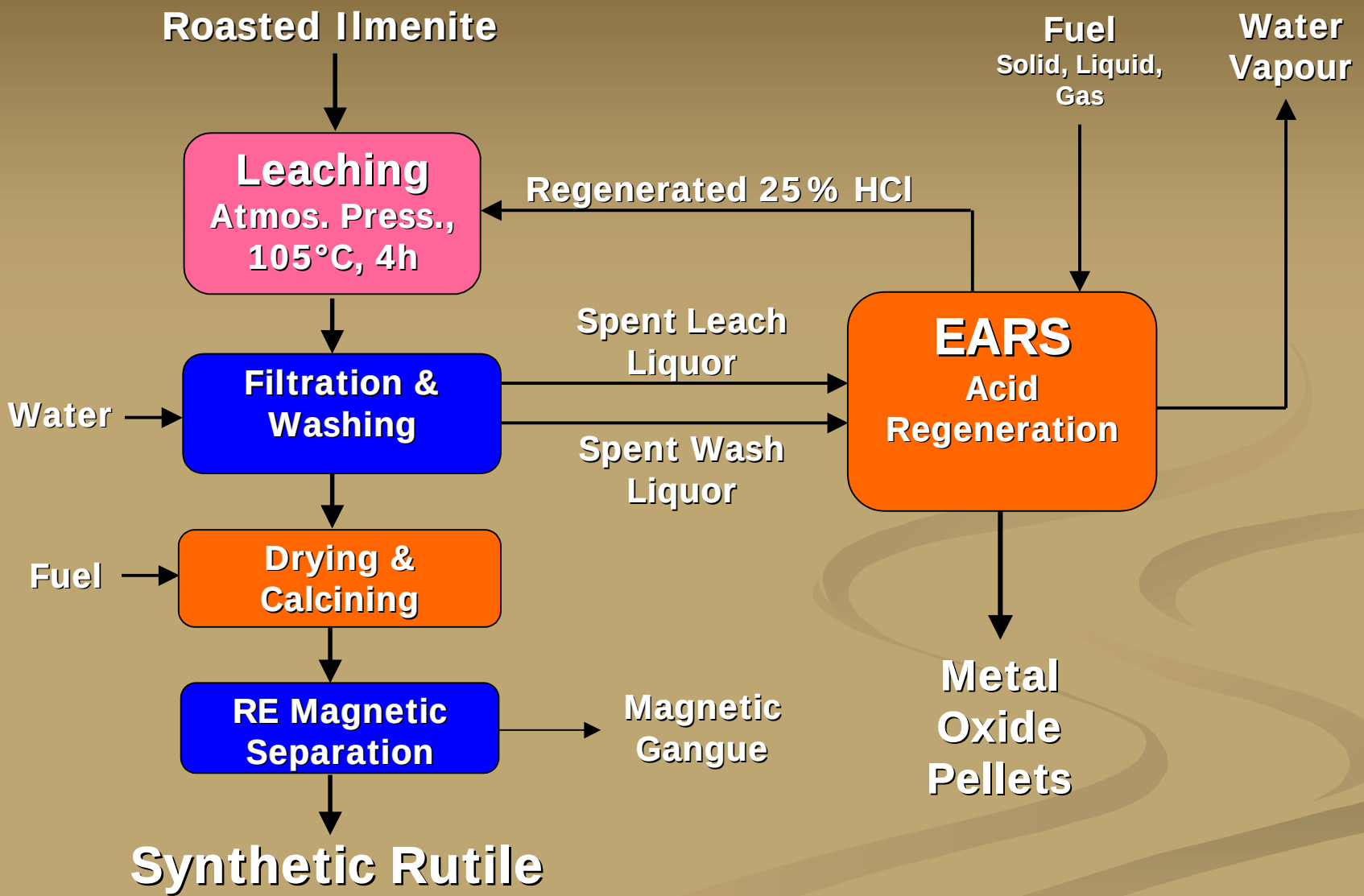
Ø 500 mm Fluid Bed Roaster

ERMS LEACHING

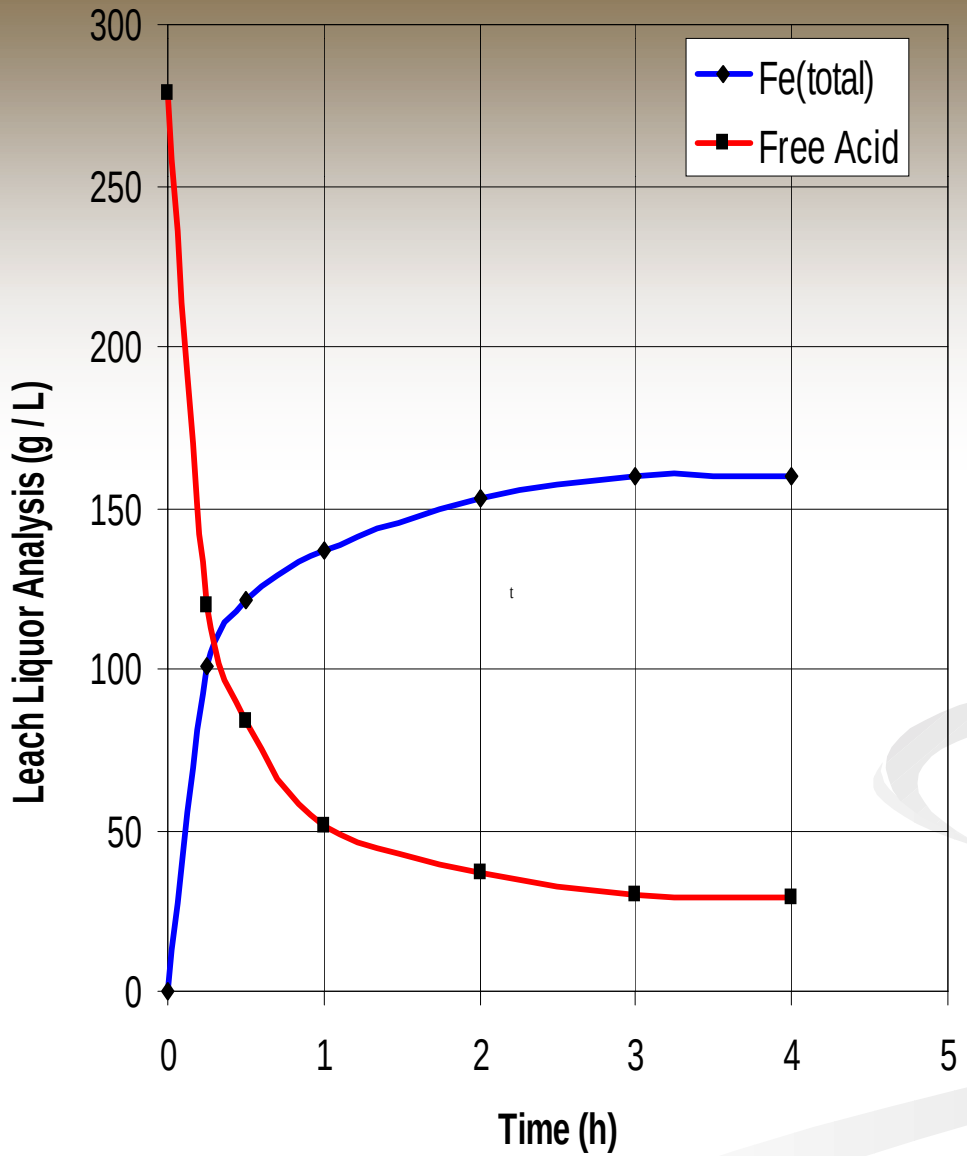
$$FeO.TiO_2 + 2HCl = TiO_2 + FeCl_2 + H_2O$$

- Metallic oxide impurities form respective chlorides
- Some silica is also removed
- TiO_2 is recovered as an insoluble
- Original ilmenite grain size is largely retained

Leaching

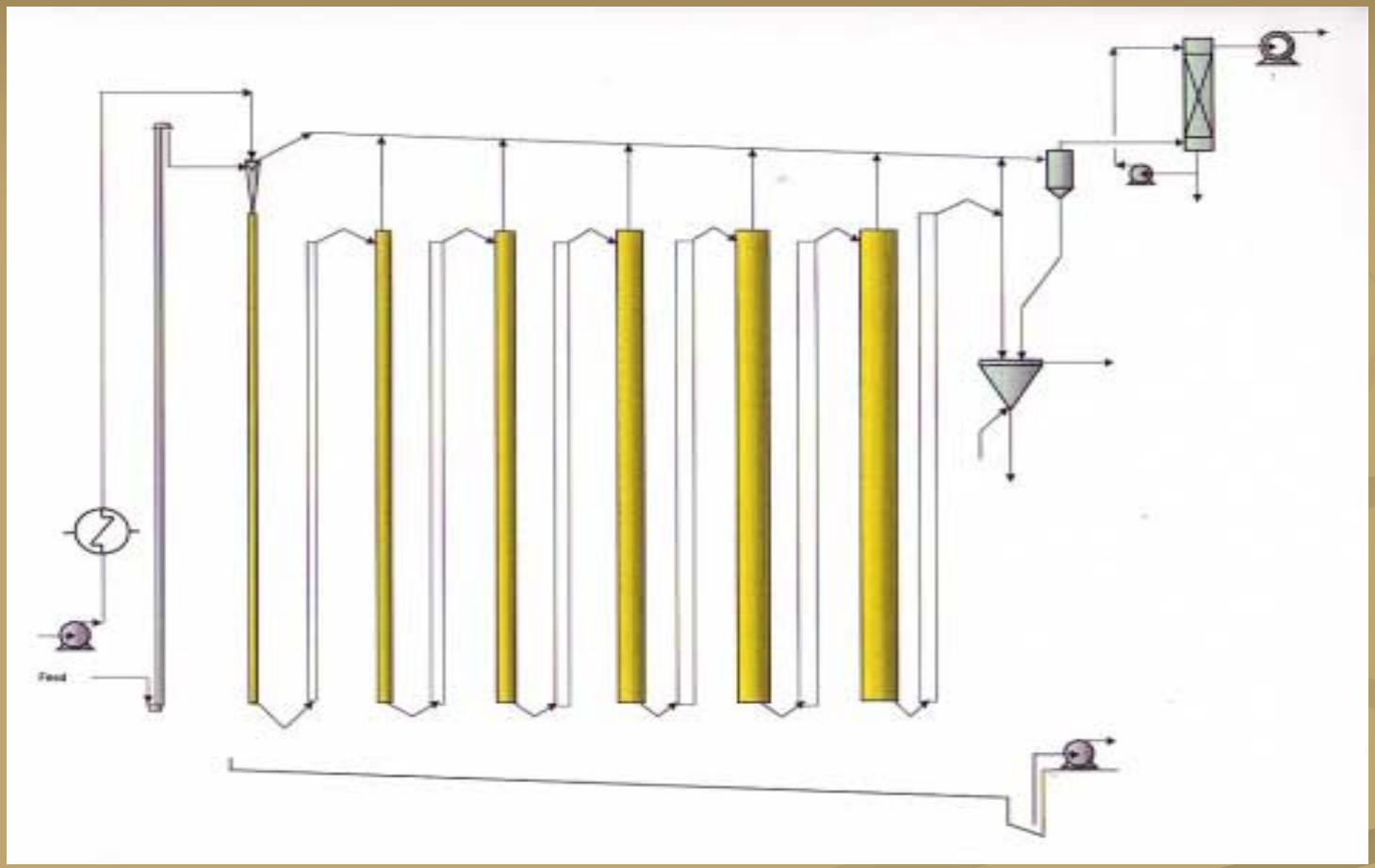

Roasted Ilmenite
Fuel
Solid, Liquid, Gas
Water Vapour
Leaching
Atmos. Press., 105°C, 4h
Regenerated 25% HCl
Spent Leach Liquor
EARS
Acid Regeneration
Water
Filtration & Washing
Spent Wash Liquor
Fuel
Drying & Calcining
RE Magnetic Separation
Magnetic Gangue
Metal Oxide Pellets
Synthetic Rutile

Ilmenite Leaching



Leach Vessels at Pilot Plant

Continuous Leach Schematic



Feed and Product Analyses for a typical Ilmenite

	TiO_2 %	Fe_2O_3 %	SiO_2 %	Cr_2O_3 %	Al_2O_3 %	MnO %	MgO %
Ilmenite	**51.0**	**48.6**	**1.48**	**0.05**	**0.75**	**0.35**	**0.86**
S.R	**97.9**	**0.74**	**0.47**	**0.03**	**0.06**	**0.03**	**0.09**

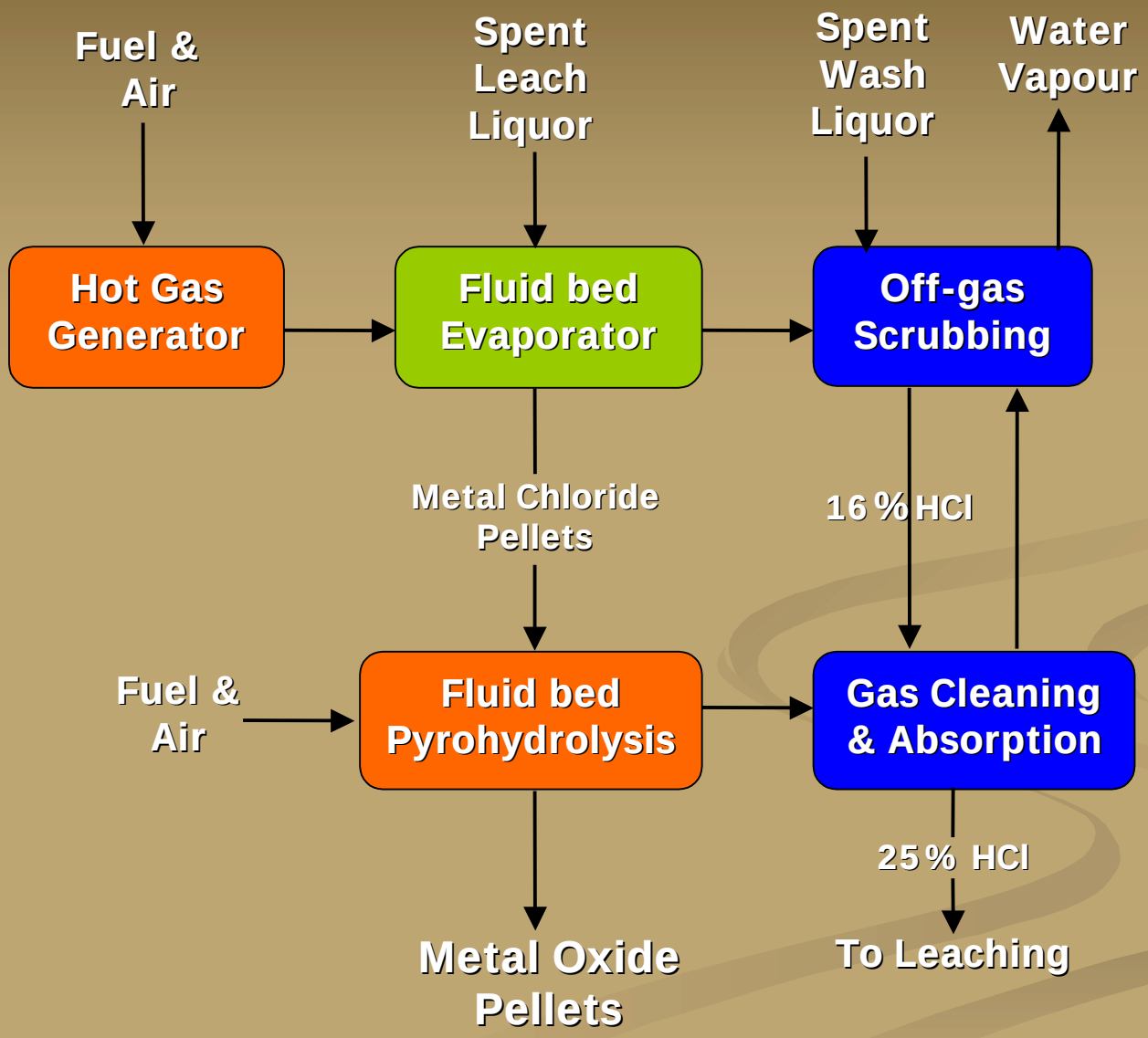
EARS Acid Regeneration Process

- Spent leach liquor is evaporated in a fluid bed to dry pellets at *low temperature* (~ 140°C)
- Pyrohydrolysis takes place at a *high temperature* (~ 800°C)

$$2FeCl_2 + 2H_2O + 0.5O_2 = 4HCl + Fe_2O_3$$

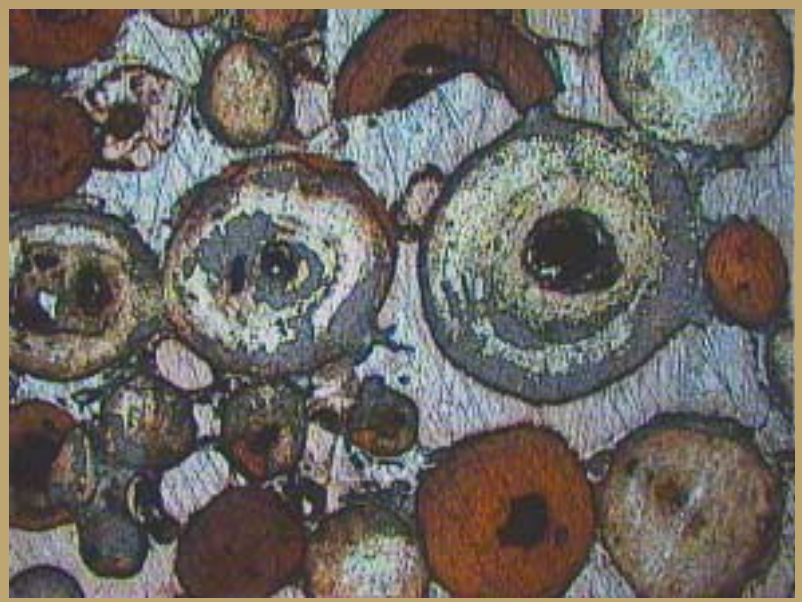
- Makes *superazeotropic* acid
- Able to use solid, liquid or gaseous fuels
- Oxide is discharged as hard *pellets* (not dust)
- Hydrochloric acid is recycled to leaching

EARS Flow Sheet



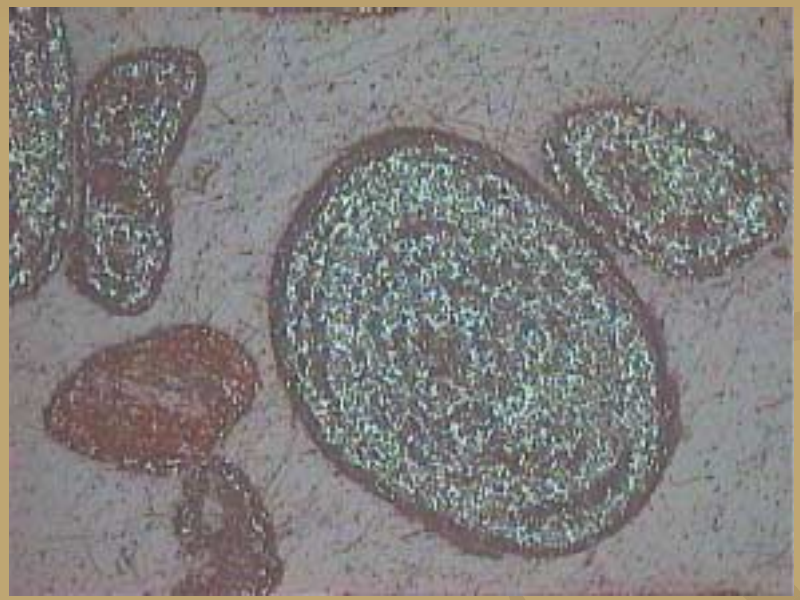
Pelletization in the EARS Process

Metal Chloride Pellets ($FeCl_2.xH_2O$)



2 mm

Metal Oxide Pellets (Fe_2O_3)



1 mm

Pyrohydrolysis Roaster

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The ERMS SR Process

- **Inputs** → **Outputs**

- **Ilmenite 2.0 t.**
- **Energy 19GJ.**
- **Synthetic Rutile 1 t.**
- **Iron Oxide 1 t.**

Technical Advantages of ERMS SR

- Applicable to all grades of ilmenite
- Simple flowsheet, uses standard equipment, cost-effective and low technology risk.
- Completely continuous process
- Able to use solid, liquid or gaseous fuels
- Ultra high quality synthetic rutile product (<97%TiO_2)
- Negligible product particle breakdown
- Iron oxide saleable and in the form of easily handled pellets

Commercial Advantages of ERMS SR

- Low capital and operating costs
- Other SR processes use batch operations
- Valuable iron by-product (>95% iron oxide)
- Other SR processes produce fine iron oxide waste with disposal problems
- Very environmentally acceptable process

30ktpa ERMS SR PLANT